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PATENT
016295.0635

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	§	
	§	
Tawil et al.	§	
	§	
Serial No.: 09/770,571	§	Group No.: 2152
	§	
Filed: January 26, 2001	§	Examiner: Philip C. Lee
	§	
Title: System and Method for Host Based Target Device Masking Based on Unique Hardware Addresses	§	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION OF KHANNAN SUNTHARAM
SUBMITTED PURSUANT TO 37 C.F.R. § 1.131

I, Khannan Suntharam, hereby declare and state that:

1. I was a lawyer at the law firm Baker Botts L.L.P. ("Baker Botts") from 1998 to 2002. While at Baker Botts, I was involved in the preparation and prosecution of patent applications for Dell Computer Corporation. During the time I was employed with the Houston office of Baker Botts, I prepared the application having U.S. Application No. 09/770,571.

2. A redacted copy of a Dell invention disclosure is attached to this Declaration as Exhibit A. This invention disclosure has been titled "Host Based Storage Device Masking Based on World Wide Names for a Storage Area Network Configuration with a Large Number of Hosts" and has been assigned Dell reference number DC-02668. This invention disclosure was received by Baker Botts on November 9, 2000 for the preparation of a patent application. This application was assigned Baker Botts attorney docket number 016295.0635.

3. I worked with Roger Fulghum, the lawyer responsible for supervising the preparation and prosecution of patent applications for Dell in Baker Botts's Houston office. In November and December of 2000 and January of 2001, I researched the prior art related to the invention and prepared the patent application for the DC-02668 invention disclosure. I was diligent in preparing this application. I worked on this application according to the following list of dates, hours worked, and description of work performed:

Date Worked	Hours Worked	Description of Work Performed
11/30/2000	2.00	Reviewed invention disclosure and related documents.
12/01/2000	4.00	Prepared for and interviewed Jacob Cherian.
12/04/2000	4.00	Reviewed tape of inventor interview.
01/13/2001	1.70	Continued to prepare draft patent application.
01/14/2001	1.50	Continued to prepare draft patent application.
01/15/2001	7.80	Continued preparation of draft application.
01/16/2001	5.30	Continued preparation of draft patent application.
01/17/2001	5.50	Continued preparation of application.
01/18/2001	8.60	Continued preparation of draft application.
01/19/2001	8.80	Continued preparation of draft patent application.
01/21/2001	0.60	Reviewed results of prior art search.
01/22/2001	4.20	Continued preparation of application.
01/23/2001	2.30	Revised draft application.
01/25/2001	1.90	Revised patent application.

4. On January 26, 2001, the patent application concerning the DC-02668 invention disclosure was filed with the U.S. Patent and Trademark Office. The patent application was titled "System and Method for Host Based Target Device Masking Based on Unique Hardware Addresses" and was assigned serial number 09/770,571.

5. I hereby declare that all statements made herein of my own knowledge are true and that all statements made herein on information and belief are believed to be true. I declare that these statements are made with the knowledge that willful false statements, and the like so made, are punishable by fine or imprisonment, or both, under Section 1001, Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signed this 17th day of October 2007.

Khannan Suntharam

EXHIBIT A

REDACTED

DC-02668
Received: September 13, 2000

INVENTION DISCLOSURE FORM

REDACTED

INVENTION TITLE:
(Brief and descriptive) Host Based Storage Device Masking Based on World Wide Names for a Storage Area Network Configuration with a Large Number of Hosts.

INVENTORS:
(Must be filled out completely)

[redacted]	Ahmad Tawil	[redacted]	25642
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[redacted]	512-733-0803		
[redacted]	Yes	[redacted]	
[redacted]	Damian Cook	[redacted]	ESG
[redacted]	Kevin Reinis (Storage)		

☐ Check here if inventor is non-Dell

[redacted]	Jacob Cherian	[redacted]	29999
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[redacted]	No	[redacted]	India
[redacted]	Damian Cook	[redacted]	ESG
[redacted]	Kevin Reinis (Storage)		

REDACTED

☐ Check here if inventor is non-Dell

REDACTED

DOCUMENTATION
Date of conception: 08/14/2000
Invention first described in: This disclosure
Additional/detailed description in:

FIRST DISCLOSURE, USE OR OFFER OF SALE OF THE INVENTION
PLEASE DO NOT SKIP THIS PART. This information is used to determine Dell's legal rights in the invention.

Has the invention been disclosed outside of Dell? Y X N
If YES, to whom was this disclosure made?
Was this disclosure made under a non-disclosure agreement (NDA)? Y N
IF YES, date of NDA

Planned date of first offer of sale of product using the invention: (if sale has not already occurred)
Actual date of first offer of sale of product using the invention: (if sale has already occurred)
Date of first production use of the invention or ship date:

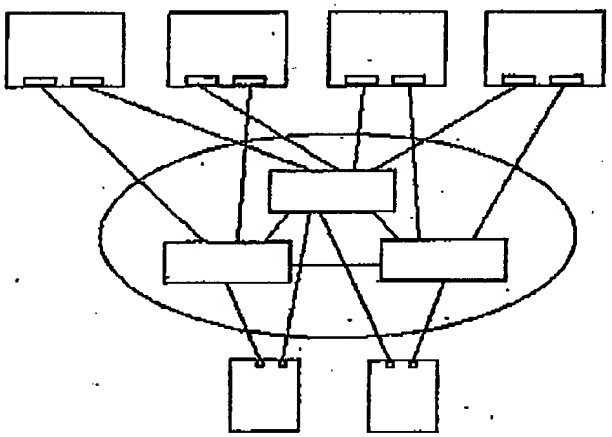
REDACTED

REDACTED

REDACTED

Problem Description:

In a large SAN environment with multiple storage devices and a large number of hosts, all hosts do not need to have access to the same storage device such as primary storage device due to limitations of the storage device in terms of storage capacity or performance bottlenecks. Large Storage Area Networks deployment is currently restricted due the fact that storage devices may have limited resources for supporting large number of hosts/HBAs on the same SAN. One of the limitations by the storage devices is number of HBA that can perform port logins per target port on the storage device. In a switched non-zoned SAN, each host sees the same storage devices on each of its HBAs and each HBA performs port logins (PLOGI) to each storage device. PLOGI is required to be issued by the HBA initiator to the storage device at initialization time before any I/Os can be performed between the HBA and the storage device. PLOGIs resource limitation by the storage devices reduces the number of hosts that the SAN can support. For example, when a storage device can handle up to 32 maximum PLOGIs then the number of HBAs connected on the SAN cannot exceed 32 hosts with single HBA or 16 hosts with dual HBAs connected to the same SAN. The picture below shows an example of SAN with 4 hosts, one fabric and two storage devices. Each host has dual HBAs. With the example below, each storage device has a total of 8 HBAs logged in with the storage device. If one of the storage devices below supports only 4 HBAs then only half of the hosts would be able to see the storage device, the rest of the server will either not see the storage device or causes the server that are logged in to be logged out by the storage device based on the implementation of the storage device.



Prior Methods

One of the methods that can be used is switched zoning. Switch zoning can either be based on World-Wide Name or physical port. The switch zoning allows group of devices (HBA and storage device) to see each

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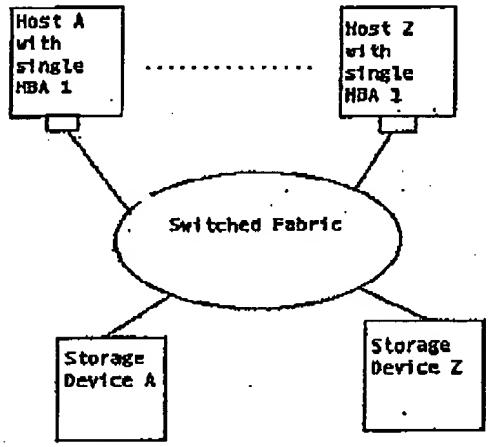
other on the network. This solution does not allow all devices to see other device on the storage network, and one vendor must be used across the network since current zoning implementations are vendor specific.

Solutions:

The proposed solution is a host based storage masking that is based on World-Wide Name (WWN) of the storage devices. The solution provides a means to configure specific hosts in the SAN to have access to specific storage devices. The solution requires each HBA on each host not to perform a port login (PLOGI) with the storage device at initialization time unless the user via an application has configured the host or the HBAs in the host to do so. The application allows the user to select the storage device based on the WWN of storage device and grants the HBA permission to perform PLOGI with that storage device. The application can get a list of the storage devices on the network from the fabric via Name Server Query commands using get node name ID (GNN_ID) and get port name ID (GPN_ID). These commands provide the HBA with the WWN information from fabric Name Server for each device on the network. The fabric constructs this list since each device such as storage or HBA on the network must perform a fabric logins (FLOGI) with the switch at initialization time. The storage device provides the WWN information of its port during fabric the login process, which is initiated by the storage device. The application can provide the list to the user for selecting storage devices on the network and can program the HBA to have permission to perform PLOGI to the storage device. The WWN of the storage devices can be retained in a table by the HBA. During initialization process, each HBA performs fabric logins followed by a Name Server Query commands such as GNN_ID and GPN_ID. After the Name Server Query commands, each HBA checks each WWN of the storage devices from the Name Server Query information against the table of WWN of the storage device saved in the HBA. If the WWN of the storage device exists both in the HBA table and Name Server database, the HBA will then initiate PLOGI to storage device so that the host can have access to the storage device. This solution restricts by default the HBAs from logging in with each storage device and wasting internal resources of the storage device on the SAN until the HBAs has been configured to login with specific storage device. The solution uses commands that are established by the standard to accomplish storage device masking to support deployment of a large number of host nodes on the SAN.

Illustration



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Consider the following SAN configuration with one fabric, multiple hosts with single HBA, and multiple storage devices. All storage device are masked off by the HBAs. To provide storage to host A, the user will have to use storage device WWN masking application to select the storage device A. The application gets the list from fabric for all storage devices on the SAN. When the user makes his selection of storage device A, the application passes the WWN information of the storage device A to the HBA in host A and instructs the HBA to initiate login procedure with the storage device A. The WWN information is then retained by the HBA in his database to be used for login procedure with storage device every time the HBA starts its initialization process on the network.

DECLARATION:
The invention described in this invention disclosure is submitted pursuant to my Employment Agreement with Dell Computer Corporation.

SIGNATURES OF INVENTORS:

Inventor(s), please sign your full name(s) and enter the date below:

(1) Ahmad Tawil _____ Date: 08/14/2000
(2) Jacob Cherian _____ Date: 08/14/2000

(If there are more than 2 inventors, please add more signature lines as appropriate.)

DECLARATIONS BY AND SIGNATURES OF TWO WITNESSES:

Witnesses, please sign and date below:

WITNESS 1
This invention was first explained to the undersigned by the inventor(s) on the 29____day of August _____/ 2000. I understood the explanation given by the inventor(s).

Ronald Scott Sinclair _____ Date: 8/29/2000_____
Signature of Witness 1

WITNESS 2
This invention was first explained to the undersigned by the inventor(s) on the of .
August 29_____/ _____2000 I understood the explanation given by the inventor(s).

James Djosi Marrone _____ Date: 29 August 2000
Signature of Witness 2

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